UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CEM BASCERI, GURTEJ S. SANDHU and MARK VISOKAY

Appeal No. 2005-2351
Application No. 09/904,112

ON BRIEF

Before GARRIS, OWENS, and WALTZ, Administrative Patent Judges.
WALTZ, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on an appeal from the primary examiner's final rejection of claims 1 through 6, 8 through 10, 15, 22 through 30, 37 through 46, 50, 57 through 63, 74 through 76, and 100 through 105 (Answer, page 2, ¶(3); Reply Brief, page 1). Claims 11 and 12 stand allowed by the examiner, claims 47 through 49 stand objected to as allowable but depending on a rejected claim (*id.*), while the remaining claims pending in this application stand withdrawn from consideration as directed to a

non-elected invention (claims 7, 13, 14, 16-21, 31-36, 51-56, 64-72, 80-99 and 106; Brief, page 2). We have jurisdiction pursuant to 35 U.S.C. § 134.

According to appellants, the invention is directed to a method of making stabilized capacitors and DRAM (Dynamic Random Access Memory) cells (Brief, page 2). Further details of the present invention may be understood from representative independent claim 1, as reproduced below:

1. A method of forming a capacitor comprising providing a conductive oxide electrode, depositing a first layer of a high dielectric constant oxide dielectric material on said conductive oxide electrode, oxidizing said conductive oxide electrode and said first layer of said high dielectric constant oxide dielectric material under oxidizing condition such that at least the surface of said conductive oxide electrode is provided with enough oxygen to provide stability with said first layer of high dielectric constant oxide dielectric material, depositing a second layer of said high dielectric constant oxide dielectric material on said first layer of said high dielectric constant oxide dielectric material, and depositing an upper layer electrode on said second layer of said high dielectric constant oxide dielectric material.

Appellants state that the claims do not stand or fall together (Brief, page 4). Accordingly, to the extent appellants present reasonably specific, substantive reasons for the separate patentability of individual claims, we consider these claims separately. See 37 CFR § 1.192(c)(7)(2003); *In re McDaniel,* 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002).

The examiner has relied upon the following references as evidence of unpatentability:

Kingon et al. (Kingon)	5,555,486	Sep. 10, 1996
Joo	5,879,957	Mar. 09, 1999
Kunitomo et al. (Kunitomo)	6,235,572	May 22, 2001

Claims 1-6, 15, 22-30, 37-42, 45-46, 74-76 and 100-105 stand rejected under 35 U.S.C. § 102(e) as anticipated by Kunitomo (Answer, page 4). Claims 8-10, 43-44, 50 and 57-61 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Kunitomo in view of Joo (Answer, page 6). Claims 62 and 63 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Kunitomo in view of Joo and Kingon (*id.*).

Based on the totality of the record, including due consideration of the opposing arguments in the Brief, Reply Brief and the Answer, we *affirm* the examiner's rejection of claims 1-6, 15, 22-30, 37-39, 74-76 and 100-105 under section 102(e) as anticipated by Kunitomo essentially for the reasons stated in the Answer and those set forth below. We *reverse* the rejection of claims 40-42 and 45-46 under section 102(e) over Kunitomo, and we also *reverse* all rejections on appeal based on section 103(a) essentially for reasons stated in the Brief, Reply Brief, and those reasons discussed below. Accordingly, the decision of the

examiner to reject the claims on appeal is *affirmed-in-part.*

A. The Rejection under § 102(e)

The examiner finds that Kunitomo discloses a method of forming a capacitor comprising providing a conductive oxide electrode, depositing a first layer of a high dielectric constant oxide dielectric material on this electrode, oxidizing the conductive oxide electrode and the first layer under oxidizing conditions, depositing a second layer of the high dielectric constant oxide dielectric material on the first layer, oxidizing the second layer, and then depositing an upper layer electrode on the second layer (Answer, page 4). Accordingly, the examiner concludes that every limitation of the claims has been described by Kunitomo (*id.;* see page 5 of the Answer regarding the limitations of various dependent claims).

Appellants argue that Kunitomo does not teach or suggest a method that includes oxidizing a conductive oxide electrode and the first layer of the high dielectric constant oxide material such that the surface of the oxide is provided with "enough oxygen to provide stability" (Brief, pages 5-6; see claim 1 on appeal). Appellants further argue that Kunitomo does not teach a method in which the lower electrodes 54 and the tantalum oxide layer 56 are oxidized as claimed, and there is no explicit

teaching in the reference that the lower electrodes 54 become oxidized due to the tantalum oxide layer 55 being crystallized (Brief, page 7; Reply Brief, page 3). Appellants also argue that the need for choosing ruthenium oxide as the conductive oxide electrode negates anticipation (Brief, page 7; Reply Brief, page 2).

Appellants' arguments are not persuasive. Kunitomo is directed to an information storage capacitor used in DRAM cells where the capacitor includes a lower electrode 54 and an upper electrode 62 consisting of a capacity insulating film 61 and a titanium nitride film (abstract). The capacity insulating film is inserted between the first and second electrodes and is a multi-layered film comprising two or more tantalum oxide films each having a polycrystalline structure (col. 3, ll. 39-51; col. 4, ll. 18-22). Kunitomo teaches crystallization of the tantalum oxide insulating film to achieve a high dielectric constant film and reduce leakage current (col. 2, ll. 33-56; col. 3, ll. 59-60). The manufacturing method for the capacity insulating film comprises the steps of (a) forming a first tantalum oxide film by a chemical vapor deposition (CVD) method; (b) crystallizing the first tantalum oxide film by a first heat treatment, thereby forming a first polycrystalline tantalum oxide film; (c) forming

a second tantalum oxide film by a CVD method; and (d) performing a second heat treatment on the second tantalum oxide film (col. 5, ll. 31-38). These heat treatments are carried out at a high temperature in an oxidation atmosphere (col. 5, ll. 58-59). The lower electrode 54 may be made from a ruthenium film (col. 18, ll. 22-24). This ruthenium film is oxidized during the heat treatment of the tantalum oxide insulating film to form ruthenium oxide (col. 20, l. 66-col. 21, l. 2). Therefore, contrary to appellants' arguments, there is no need for "choosing" ruthenium as the electrode material since the use of a ruthenium film as the lower electrode 54 is clearly described by Kunitomo. Furthermore, as conceded by appellants (Brief, page 7; Answer, page 9), if ruthenium is used as the lower electrode, the lower electrode will be oxidized during the heat treatment of the tantalum oxide insulating film. We note that Kunitomo only teaches restricting further oxidation during crystallization of the tantalum oxide films when ruthenium oxide is formed as the lower electrode 54 since these lower electrodes have already been oxidized (col. 21, ll. 23-30).

As correctly argued by appellants (Brief, page 7; Reply Brief, page 2), Kunitomo does not explicitly describe that the oxidation of the lower electrode and first layer of high

dielectric constant oxide dielectric material occurs "under oxidizing conditions such that at least the surface of said conductive oxide electrode is provided with enough oxygen to provide stability" (e.g., see claim 1 on appeal). However, we determine that appellants have not pointed to any disclosure in their specification where any definitions or guidelines establishing the specific oxidizing conditions necessary to meet this claimed functional limitation are taught. As correctly noted by the examiner (Answer, pages 9-10), appellants merely disclose that oxidation of the lower electrode provides the conductive oxide with enough oxygen to provide stability. Furthermore, we determine that the examiner has established that Kunitomo describes oxidizing steps under the same conditions as appellants' process, directed to the same materials (ruthenium electrodes and tantalum oxide insulating film) for the same advantages (to reduce leakage current in DRAM cells) as appellants' process. Therefore, we determine that the examiner has shifted the burden to appellants to establish that the oxidizing conditions and amount of oxygen claimed differ substantially from the conditions and amounts disclosed by Kunitomo. *See In re Best,* 562 F.2d 1252, 1255, 195 USPQ 430, 433

(CCPA 1977). On this record, appellants have not met this burden.

With regard to the rejection of claim 2, appellants argue that Kunitomo does not teach or suggest oxidation by a gas plasma treatment but appears to "teach away" from it (Brief, paragraph bridging pages 7-8). This argument is not persuasive since Kunitomo teaches that a thermal or plasma treatment at "about 400 °C." produces a "disadvantageous" result as compared to a higher temperature heat treatment that results in crystalline tantalum oxide (col. 2, ll. 18-32). Therefore, Kunitomo does not teach away from plasma treatments at higher temperatures as long as crystallization of the tantalum oxide occurs. *See In re Gurley,* 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994). We further note that the question of whether a reference "teaches away" from the claimed invention is inapplicable to an anticipation analysis. *See Celeritas Techs., Ltd. v. Rockwell Int'l Corp.,* 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522 (Fed. Cir. 1998).

With regard to appellants' arguments concerning the rejection of claims 4, 6 and 37-39 (Brief, pages 8-9), we adopt the examiner's response and reasoning as set forth on pages 11

and 13 of the Answer.[1] With regard to the rejection of claims 15 and 28, appellants argue that Kunitomo fails to disclose or suggest oxidizing the second layer of crystalline tantalum oxide (Brief, pages 8-9). This argument is not well taken since, as noted by the examiner (Answer, pages 12-13), Kunitomo teaches that the second tantalum oxide film is heat treated and crystallized by the same treatment as used on the first tantalum oxide film (e.g., see col. 19, ll. 47-58).

For the foregoing reasons and those stated in the Answer, we determine that the examiner has established a prima facie case of anticipation which has not been adequately rebutted by appellants. Accordingly, we affirm the examiner's rejection of claims 1-6, 15, 22-30, 37-39, 74-76 and 100-105 under section 102(e) as anticipated by Kunitomo.

With regard to the section 102(e) rejection of claims 40-42 and 45-46, we determine that the examiner has not established that all claimed steps have been described by Kunitomo (Brief, page 9; Reply Brief, page 4). Claims 40-42 and 45-46 all require a step of "oxidizing said upper layer electrode" (see claim 40 on

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[1]We note that the examiner has applied additional references on page 13 of the Answer. We have not considered these additional references as part of the evidence in this appeal. *See In re Hoch,* 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970).

appeal). In this rejection (Answer, pages 4-5), the examiner fails to find that Kunitomo discloses the oxidation of the upper electrode (see Kunitomo, col. 21, ll. 47-65). Therefore, the examiner has failed to establish a prima facie case of anticipation and we cannot sustain the rejection of claims 40-42 and 45-46 under section 102(e) over Kunitomo.

B. The Rejections under § 103(a)

The examiner finds that Kunitomo discloses the method "as substantially claimed" but does not disclose the method of oxidizing the upper layer electrode using a gas plasma and a temperature from about 250 to 500 °C. (Answer, page 6). Therefore, the examiner applies Joo for the disclosure of a method of oxidizing an electrode using gas plasma (*id.*). In view of these findings, the examiner concludes that it would have been obvious to one of ordinary skill in the art at the time of appellants' invention to oxidize the upper electrode of Kunitomo by a gas plasma technique as taught by Joo "in order to avoid a heat treatment at a high temperature" (*id.*). We disagree.

From the examiner's finding that Kunitomo does not disclose the specific claimed method of oxidizing the upper layer electrode, it is implicit that Kunitomo does disclose oxidizing the upper layer electrode in general. However, as discussed

above with regard to the section 102(e) rejection of claims 40-42 and 45-46, the examiner has not specifically pointed to any disclosure or suggestion in Kunitomo of oxidizing the upper layer electrode. This is the first deficiency in the examiner's rejection. The second deficiency in the examiner's rejection is the failure to establish a convincing reason, suggestion or motivation to combine the references as proposed. *See In re Dembiczak,* 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). The examiner states that "since plasma methods are commonly done at lower temperatures than thermal oxidation methods one of ordinary skill in the art would perform a plasma method rather than a thermal method with a high temperature so that the thermal budget may be lowered." Answer, page 16. As correctly argued by appellants (Reply Brief, page 5), the examiner has provided no factual basis or evidence to support this obviousness conclusion. *See In re Lee,* 277 F.3d 1338, 1344-45, 61 USPQ2d 1430, 1434-35 (Fed. Cir. 2002). Furthermore, the examiner's motivation presupposes that a thermal oxidation method is used by Kunitomo and the artisan would have substituted the gas plasma method of Joo "so that the thermal budget may be lowered" (Answer, page 16). However, as discussed above, the examiner has not pointed to any disclosure or teaching in

Kunitomo of oxidizing the upper layer electrode, much less using a thermal oxidation method.

For the foregoing reasons and those stated in the Brief and Reply Brief, we determine that the examiner has not established a prima facie case of obviousness in view of the reference evidence. Accordingly, the rejection of claims 8-10, 43-44, 50, and 57-61 under section 103(a) over Kunitomo in view of Joo is reversed.

With regard to the rejection of claims 62-63, the examiner applies Kingon in addition to Kunitomo and Joo to show a method of forming a platinum electrode upon an upper layer electrode (Answer, pages 6-7). Accordingly, we determine that Kingon does not remedy the deficiencies discussed above with respect to Kunitomo and Joo. Therefore, we also reverse the rejection of claims 62-63 under section 103(a) over Kunitomo in view of Joo and Kingon.

C. Summary

The rejection of claims 1-6, 15, 22-30, 37-39, 74-76 and 100-105 under 35 U.S.C. § 102(e) over Kunitomo is affirmed.

The rejection of claims 40-42 and 45-46 under 35 U.S.C. § 102(e) over Kunitomo is reversed. The rejection of claims 8-10, 43-44, 50 and 57-61 under 35 U.S.C. § 103(a) over Kunitomo in

view of Joo is reversed. The rejection of claims 62-63 under 35 U.S.C. § 103(a) over Kunitomo in view of Joo and Kingon is reversed.

The decision of the examiner is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(iv)(2004).

AFFIRMED-IN-PART

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